

Contribution to the knowledge of the bat fauna of Bioko island, Equatorial Guinea (Central Africa)

By J. JUSTE B. and C. IBÁÑEZ

Estación Biológica de Doñana, Consejo Superior de Investigaciones Científicas, Sevilla, Spain

Receipt of Ms. 16.3.1994

Acceptance of Ms. 2.6.1994

Abstract

Although having been long studied, the bat fauna of Bioko island (formerly Fernando Poo, Equatorial Guinea, Central Africa), is still little known. The species *Hipposideros commersoni*, *Glauconycteris beatrix*, *Pipistrellus (P.) kuhlii*, *P. (N.) tenuipinnis*, and *P. (N.) cf. capensis* are reported for the first time. Furthermore, the species *Myonycteris torquata*, *Taphozous mauritanus*, *Nycteris arge*, *Hipposideros cyclops*, *Glauconycteris poensis*, *Mops (X.) spurrelli* and *M. (X.) thersites*, previously reported as doubtful, are confirmed on Bioko. These results increase the bat checklist for Bioko island by 25 %, and it now includes 26 species.

Introduction

Bioko island (formerly Fernando Poo), is situated 32 km off the coast of Cameroon (3° 48' –3° 12' N, 8° 25' –8° 57' E), in the middle of the Gulf of Guinea. Since it was a commonly used starting point for many scientific expeditions to the African mainland, many mammal species, including bats, were first described from Bioko specimens in the 19th century (e.g. *Dendrohyrax dorsalis*, *Colobus satanas*, *Glauconycteris poensis*, *Rhinolophus landeri*, etc.). Nevertheless, our understanding of the bat fauna of Bioko, is still fragmentary. BASILIO (1962), in a general view of the fauna of Equatorial Guinea (a former Spanish colony), gave some data on Bioko's bats. EISENTRAU (1964, 1973) summarized the bat fauna of Bioko after collecting on the island for some months. He considered that up to 20 species were present (in 1973); although he doubted some (e.g. *Myonycteris torquata* or *Glauconycteris poensis*) and stressed the need to confirm others. Later on, IBÁÑEZ and VALVERDE (1985) added *Eptesicus platyops* (as a probable synonym of *E. serotinus*) to the bat list of Bioko.

Material and methods

From 1988 to 1991, a systematic sampling was carried out by the senior author throughout the island. Bats were caught by netting and visiting possible roosting places as part of a wider study of the bat fauna of the Gulf of Guinea Islands. Collected specimens were deposited in the Estación Biológica de Doñana (EBD) collections and were compared with material from the Museo Nacional de Ciencias Naturales de Madrid (MNCN). Selected measurements of adult specimens are given in mm, together with the number of specimens (brackets) and ranges (parentheses). Both sexes were summarized when no significant dimorphism was found.

Abbreviations used are: FA = forearm length; GSL = greatest skull length; CBL = condylobasal length; CCL = condylocanine length; ZW = zygomatic width; DCC = distance between canines (from outer side) and MW = mastoid width. Species are named according to CORBET and HILL (1986), except for Vespertilionidae, which follow HILL and HARRISONJ (1987), and Molossididae, which follow KOOPMAN (1993).

Results

As a result of this research, five new species are recorded and another seven confirmed. The list of bat species known to occur in Bioko comprises now 26 species.

Pteropodidae

Myonycteris torquata (Dobson, 1878)

Material [1]: Eolá river, Patio Vivancos, Baney: 1 subadult ♂.

Selected measurements: FA 58.0; GSL 31.0; CBL 29.8; ZW 18.9.

Remarks: The only known specimen was reported by KRUMBIEGEL (1942) without locality. EISENTRAUT (1964) did not catch any specimens on his expeditions and even doubted its presence. In his *Myonycteris* revision, BERGMANS (1976) studied only the skin of KRUMBIEGEL's specimen and raised the possibility that the bat belongs to *M. brachycephala*, an endemic from nearby São Tomé island (BOCAGE 1889).

The Baney specimen confirms the presence of *Myonycteris torquata* on Bioko island. It was netted in a secondary forest surrounded by agricultural crops and cocoa plantations. Although still subadult, the skull clearly shows the typical *M. torquata* shape, mainly in its wide post-dental palatum bone and weak "fascia temporalis" in the zygomatic arches. Furthermore, the specimen does not share any of the characteristic dental features described by ANDERSEN (1912a) for *M. brachycephala*. *Myonycteris torquata* has not been found again, in spite of intense netting efforts. It can be considered the most rare fruit bat on Bioko island. Moreover, the fact that the species is subadult and was captured in the western point closest to the mainland would support the possibility of *M. torquata* being represented on Bioko only by vagrant or migrant individuals that sporadically reach the island.

Emballonuridae

Taphozous mauritianus Geoffroy, 1818

Material [13]: All obtained in Malabo: 6 adult ♂♂, 2 subadult ♂♂, 3 adult ♀♀ and 2 subadult ♀♀.

Selected measurements [9]: FA mean 61.2 (58.7–65.0); GSL mean 22.1 (21.8–22.5); CCL mean 20.6 (20.2–21.2); ZW mean 12.9 (12.4–13.4).

Remarks: *Taphozous mauritianus* was apparently first cited from Bioko as early as 1876 by PETERS (EISENTRAUT 1964). Another specimen is mentioned by BASILIO (1962), but EISENTRAUT did not find it. The presence of *T. mauritianus* is confirmed by our series. The bats were caught while roosting in coconut palms in Malabo city. Therefore, the species probably occupies most of the coastal coconut tree plantations on the island. The confirmation of this widespread African species was expected since it has been recently found on other islands in the Gulf of Guinea (JUSTE and IBÁÑEZ 1993).

Nycteridae

Nycteris arge Thomas, 1903

Material [42]: Malabo–Riaba road, km 3: 1 adult ♂. Malabo–Riaba road, km 10: 1 adult ♂ and 2 adult ♀♀. Malabo–Riaba road, km 61: 6 adult ♂♂ and 7 adult ♀♀. Malabo–Riaba road, km 62: 2 adult ♂♂ and 3 adult ♀♀. Bantabaré, Riaba: 1 adult ♀. Malabo–Luba road, km 3: 1 adult ♂ and 3 adult ♀♀. Malabo–Luba road, km 13: 1 adult ♂ and 1 adult ♀. Malabo–Luba road, km 15: 1 adult ♀. Elgorriaga, Malabo–Luba road, km 19: 1 adult ♂.

Malabo–Luba road, km 40: 2 adult ♂♂. Malabo–Luba road, km 42: 2 adult ♂♂ and 2 adult ♀♀. Batete, Luba: 1 adult ♂. Luba: 4 adult ♂♂.

Selected measurements: FA [42] mean 42.1 (36.4–48); GSL [24] mean 19.5 (18.2–21.1); CCL [23] mean 16.9 (15.9–18.4); ZW [24] mean 11.4 (10.2–12.6); DCC [24] mean 4.7 (4.3–5.5).

Remarks: The only known specimen was obtained at the beginning of the century on the southwestern coast (Bantabaré) and recorded by ANDERSEN (1912b) and considered as *N. hispida* (EISENTRAUT 1973). Our series confirms the presence of *N. arge* on Bioko island as a common species in both forest and cocoa plantations all over the island. It has been found inside tree holes and drains. The wide variation in the measurements of the population is outstanding; even so, our figures fit well within the ranges given for the species (KOOPMAN 1975; VAN CAKENBERGHE and DE VREE 1985).

Hipposideridae

Hipposideros commersoni (Geoffroy, 1813)

Material [22]: Ericorico river, Malabo–Riaba road, km 3: 2 adult ♂♂, 1 subadult ♂. Grande river, Riaba: 1 adult ♀. Timbabé river, Malabo–Luba road, km 3: 1 adult ♂. Basupú, Malabo–Luba road, km 14: 1 adult ♀. Bosao river, Malabo–Luba road, km 20: 3 adult ♂♂ and 3 adult ♀♀. Apú river, Malabo–Luba road, km 21: 1 subadult ♂ and 1 subadult ♀. Eolá river, Patio Vivancos, Baney: 3 adult ♂♂, 1 subadult ♂, and 2 subadult ♀♀. Borabuopé river, Mallo plantation, Malabo: 2 adult ♂♂.

Selected measurements: Males: FA [12] mean 104.0 (102.0–105.8); GSL [11] mean 38.7 (36.1–39.2); CBL [11] mean 33.5 (31.3–34.7); DCC [11] mean 11.2 (10.5–11.8); ZW [11] mean 22.0 (21.4–23.2). Females FA [6] mean 99.0 (96.4–100.4); GSL [4] mean 37.2 (36.5–38.6); CBL [4] mean 32.4 (31.7–33.1); DCC [4] mean 10.3 (9.8–11.1); ZW [4] mean 20.6 (19.9–21.8).

Remarks: *Hipposideros commersoni* was first cited for Bioko by CABRERA (1912) by means of a purchased male specimen. It was not considered by EISENTRAUT (1964, 1973) and HAYMAN and HILL (1971) but was mentioned again in a recent inventory of the bat collection of the Museo de Ciencias Naturales in Madrid (IBÁÑEZ and FERNÁNDEZ 1989). The specimen (MNCN N°128) has been re-studied, and turned out to be an adult *Hipposideros* male, but noticeably smaller (FA 84; GSL 30.1; CBL 26.3; DCC 7.0; ZW 16.2) than specimens of our *H. commersoni* series. The body fur (in alcohol) is yellowish orange and lacks the *H. commersoni*'s typical dark spots on the shoulders. The MNCN N°128's skull, is clearly weaker than a typical *H. commersoni*'s, without any crest and showing duller edges of the rostrum. We now conclude that the specimen MNCN N°128 does not belong to *H. commersoni*; rather, it is a mislabelled *Hipposideros*, probably belonging to the Asian '*diadema*' group of HILL (1963).

Therefore, our series represents the first real *H. commersoni* specimens from Bioko. Their measurements fit well into the range of *H. commersoni gigas* (ROSEVEAR 1965). They were netted across rivers in both cocoa plantations and rain forest and no shelters were found.

Hipposideros cyclops (Temminck, 1853)

Material [18]: Bioko (unknown locality): 1 adult ♀. Malabo–Riaba road, km 2: 6 adult ♀♀. Ericorico river, Malabo–Riaba road, km 3: 1 adult ♀. Vda. Mera plantation, Malabo–Luba road, km 5: 1 adult ♂ and 4 adult ♀♀. Luba: 2 adult ♂♂ and 1 adult ♀. Eolá river, Patio Vivancos, Baney: 1 adult ♀. Borabuopé river, Mallo plantation, Malabo: 1 adult ♂.

Selected measurements: Males: FA [5] mean 67.2 (66.0–68.3); GSL [2] mean 29.3; CCL [2] mean 25.9 (25.7–26.0); DCC [2] mean 8.2 (8.1–8.3); MW [2] mean 12.2 (12.1–12.4); ZW

[2] mean 16.2 (16.1–16.3). Females: FA [13] mean 70.1 (69.0–72.5); GSL [9] mean 29.4 (28.4–30.5); CCL [9] mean 26.0 (25.1–27.0); DCC [9] mean 8.1 (7.7–8.7); MW [9] mean 12.6 (12.3–12.9); ZW [9] mean 16.5 (16.0–17.0).

Remarks: EISENTRAUT (1964, 1973) included this species in the bat fauna of Bioko based on a photograph by BASILIO (1962), but without having seen any specimens. Our series confirms the presence of *Hipposideros cyclops* on Bioko as a quite common bat, and as a typical dweller of trunk holes in both forest and cocoa plantations throughout the island.

Vespertilionidae

Glauconycteris poensis (Gray, 1842)

Material [20]: Ericorico river, Malabo-Riaba road, km 3: 1 ♂ and 1 ♀. Vda. Mera plantation, Malabo-Luba road, km 5: 1 ♀. Bosao river, Malabo-Luba road, km 20: 1 ♀. Apú river, Malabo-Luba road, km 21: 2 ♀♀. Oprocage farm, Moka, Luba: 2 ♂♂ and 1 ♀. Matadero river, Malabo: 1 ♀. Borabuopé river, Mallo plantation, Malabo: 1 ♂ and 7 ♀♀. Ela Nguema, Malabo: 1 ♀. Basilé peak road, km 1: 1 ♂.

Selected measurements: Males: FA [5] mean 38.5 (37.5–39.6); GSL [1] 13.0; CCL [1] 12.9; ZW [1] 9.7; MW [1] 8.5; DCC [1] 4.8. Females: FA [15] mean 39.3, (36.2–41.3); GSL [8] mean 13.0 (12.7–13.5); CCL [8] mean 12.8 (12.5–13.2); ZW [6] mean 9.5 (9.3–9.9); MW [8] mean 8.3 (7.8–8.5); DCC [8] mean 4.7 (4.5–4.9).

Remarks: The species was named *G. poensis* because Bioko island (formerly Fernando Poo) was thought, by mistake, to be the type locality instead of Abo, lower Niger (AELLEN 1952). EISENTRAUT (1964) mentioned only a young *Glauconycteris* tentatively identified as a *G. poensis*, but questioned its presence on Bioko. All the captured specimens show a tawny yellowish fur with tricoloured hairs, typical white flank-stripes and shoulder-spots. The FA measurements fit well within the range of the *G. poensis* given by ROSEVEAR (1965), the skulls from Bioko being a little bigger. Therefore, *Glauconycteris poensis* is confirmed on Bioko island, where it has been netted up to 1300 m a.s.l. (Moka) and where it is apparently common, including within cocoa plantations.

Glauconycteris beatrix Thomas, 1901

Material [4]: Basupú, km 14 Malabo-Luba road: 1 ♀. Matadero river, Malabo: 1 adult ♀. Borabuopé river, Mallo plantation, Malabo: 2 adult ♀♀.

Selected measurement: FA mean 38.6 (36.4–40.2).

Remarks: This is the first record of *Glauconycteris beatrix* from Bioko island, known already from Cameroon (AELLEN 1952). The specimens differ from the former species in that they have differently shaped ears and tragus. The fur colour is also notably darker and the white flank-stripes are absent, although one specimen shows small white shoulder-spots (EBD 20503). *Glauconycteris beatrix* has been netted in the same habitats as *G. poensis* in both cocoa plantations and forests, but it is much rarer.

Pipistrellus (Pipistrellus) kublii (Natterer, 1817)

Material [4]: Lake Biao, Moka: 3 adult ♂♂ and 1 adult ♀.

Selected measurements: FA [4] mean 35.5 (34.4–37); GSL [4] mean 13.4 (13.0–13.8); CCL [3] mean 12.4 (12.1–12.8); MW [4] mean 7.3 (7.2–7.4); DCC [4] 4.3 (4.1–4.6).

Remarks: All four specimens show the distinctive conic shape of the upper inner incisors and the upper premolar, clearly noticeable from the outside. No white along the wing membrane border, or along the uropatagium is noted, and the measurements match those given for Cameroon specimens (HILL 1968).

This newly recorded species from Bioko island is apparently montane since it has been collected only above 1300 m. *Pipistrellus kuhlii* shows a continuous distribution along a coastal fringe from northern Africa southward through the eastern coast and reaching as far as Cape Province (HILL 1968) *P. kuhlii* is scattered throughout West-Africa. It has been recorded from the Canary Islands (TRUJILLO 1991); La'youn (El Aaiún), Western Sahara (IBÁÑEZ and FERNÁNDEZ 1989); the Cape Verde Islands (AZZAROLI PUCETTI and ZAÑA 1988); and from some mountain areas of western tropical Africa, such as Mount Nimba (HILL 1982) and Mount Cameroon (HILL 1968).

Pipistrellus (Neoromicia) tenuipinnis (Peters, 1872)

Material [4]: Bosao river, Malabo-Luba road, km 18: 1 adult ♀. Borabuopé river, Mallo plantation, Malabo: 3 adult ♀♀.

Selected measurements: FA [4] mean 31.6 (31.0–32.0); MW [1] 7.0; ZW [1] 8.0; DCC [1] 4.4.

Remarks: *P. tenuipinnis* is widespread in western and central Africa (ROSEVEAR 1965) and it is well known on nearby Mount Cameroon (AELLEN 1952). The specimens collected show typically whitish and translucent wings. They represent the first record of *P. tenuipinnis* from Bioko, where they have been netted mainly in cocoa plantations.

Pipistrellus (Neoromicia) cf. capensis (Smith, 1829)

Material [18]: Ericorico river, Malabo-Riaba road, km 3: 1 adult ♂, 1 adult ♀. Grande river, Riaba: 1 adult ♀. Vda. Mera plantation, Malabo-Luba road, km 3: 2 adult ♀♀. Sampaca, Malabo-Luba road, km 7: 2 adult ♀♀. Bosao river, Malabo-Luba road, km 20: 1 adult ♀. Musola river, Luba: 2 adult ♀♀. Eolá river, Patio Vivancos, Baney: 1 adult ♀. Borabuopé river, Mallo plantation, Malabo: 1 adult ♂ and 5 adult ♀♀. Basilé village, Malabo: 1 adult ♂.

Selected measurements: Males [3]: FA mean 34.8 (34.5–35.0); GSL mean 13.9 (13.8–14.0); CBL mean 12.9 (12.8–13.0); DCC mean 4.3 (4.2–4.4). Females: FA [15] mean 35.4 (34.0–37.0); GSL [13] mean 13.9 (13.6–14.4); CBL [13] mean 13.1 (12.7–13.6); DCC [13] mean 4.4 (4.2–4.6); ZW [6] mean 9.0 (8.8–9.3).

Remarks: All Bioko specimens have dull brown fur. Their average measurements are slightly larger than the values given by KOOPMAN (1975) for *P. capensis*, but agree with those given by ROSEVEAR (1965). The systematics of this group remain very entangled, especially regarding the West African forms. We therefore consider our specimens at present as *Pipistrellus (N.) cf. capensis*, which is the first record of the species from Bioko island.

Molossidae

Mops (Xiphonycteris) spurrelli (Dollman, 1911)

Material [32]: Ericorico river, Malabo-Riaba road, km 3: 3 adult ♂♂ and 17 adult ♀♀. Grande river, Riaba: 2 adult ♂♂. Timbabé river, Malabo-Luba road, km 3: 1 adult ♀. Apú river, Malabo-Luba road, km 21: 1 adult ♂ and 7 adult ♀♀.

Selected measurements: Males: FA [6] mean 28.7 (28.0–29.7); GSL [2] mean 15.9 (15.9–16.0); CBL [2] mean 14.7 (14.7–14.8); CCL [2] 14.5; DCC [2] mean 4.6 (4.5–4.8); ZW [2] mean 10.2 (10.0–10.5) MW [2] mean 9.5 (9.4–9.6). Females: FA [26] mean 28.2 (27.0–29.6); GSL [12] mean 15.4 (15.1–15.8); CBL [12] mean 13.9 (13.6–14.3); CCL [12] 13.7 (13.3–14.1); DCC [12] mean 3.9 (3.5–4.1); ZW [12] mean 9.6 (9.3–10.0); MW [12] mean 9.3 (9.1–9.3).

Remarks: This species had been known from Bioko by one specimen from Banapá

(BASILIO 1962) and another specimen without specific locality (KOCK 1969). Its presence on the island was, therefore, questioned (HAYMAN and HILL 1971; EISENTRAUT 1973). A new series confirms the presence of *Mops spurrelli* on the island; surprisingly, it seems to be the most common molossid. It was captured along most of the rivers suitable for the species on the island.

Mops (Xiphonycteris) thersites (Thomas, 1903)

Material [24]: Grande river, Riaba: 2 adult ♂♂, 9 adult ♀♀ and 1 subadult ♀. Ericorico river, Malabo–Riaba road, km 3: 4 adult ♀♀. Apú river, Malabo–Luba road, km 21: 1 adult ♀. Lopesi river, Malabo: 2 adult ♂♂ and 4 adult ♀♀. Matadero river, Malabo: 1 adult ♀.

Selected measurements: Males [4]: FA mean 38.7 (38.0–39.5); GSL mean 20.3 (18.9–21.3); CBL mean 18.1 (17.6–18.5); CCL mean 17.4 (16.9–17.7); DCC mean 5.6 (5.4–6.0); MW mean 11.3 (10.9–11.8); ZW mean 12.5 (11.9–12.8). Females: FA [19] mean 38.6 (37.0–40.2); GSL [18] mean 19.1 (18.5–20.0); CBL [18] mean 17.4 (16.7–17.9); CCL [18] mean 16.8 (16.3–17.2); DCC [18] mean 5.2 (4.9–5.4); MW [18] mean 11.0 (10.6–11.3); ZW [18] mean 11.9 (11.7–12.2).

Remarks: There has been some confusion about the middle-sized molossids of Bioko island. A single specimen from Bantabaré was first identified as *Chaerephon pumila* (DOBSON 1878) and subsequently as *Mops leonis* (THOMAS 1908), at present *M. brachypterus*. Consequently, both species were long accepted as inhabitants of the island, (e.g. HAYMAN and HILL 1971). EISENTRAUT (1964) mentioned both species from the island but later considered that the specimen may actually represent *Mops thersites* (EISENTRAUT 1973), although the record is still accepted as *Chaerephon pumila* elsewhere (KOOPTMAN 1993).

The new series confirms the presence of *Mops thersites* on the island as a common bat, at least in the lowland zones and cities.

Discussion

Among Bioko's previously known bat species, *Eptesicus platyops*, *Chaerephon pumila*, *Mops brachypterus* and *Nycteris hispida* have not been captured in spite of our intense netting efforts. The absence of *C. pumila* and *M. brachypterus* seems to confirm EISENTRAUT's (1973) statement of a systematic mistake. We agree that these last two species should not be included in the checklist of Bioko. Finally, only three *Nycteris hispida* specimens are known from Bioko, all of them from the 19th century. We have checked the identity of one of them (MNCN N° 76) and it apparently belongs to *N. hispida*, although its tragus is not semilunate and only one incisor can be considered trifold because of wear. The remaining two specimens have recently been studied by VAN CAKENBERGHE and DE VREE (1993).

The newly found bat species, and the confirmed ones, strengthen the resemblance of Bioko's bat fauna to that of the Mount Cameroon zone. Almost all of these bats have previously been recorded there. Finally, the absence of endemism in the bat fauna of Bioko is apparently confirmed. This is in contrast to other mammal groups like such as primates, which reach up to 70% of endemism at a subspecific level (BUTYNSKI and KOSTER 1986). Bioko, a typical landbridge island, was connected with the mainland relatively recently, about 6,000 years ago (THYS VAN DEN ANDENAUERDE 1967). This fact, coupled with the high vagility of bats, is likely to have hampered any speciation process among the group on Bioko.

Acknowledgements

We wish to thank ANTONIO AYONG NGUEMA for his help, support, and friendship throughout so many years of field work, and Mr. LEANDRO MBOMFO NSUÉ, former Minister of Culture of Equatorial Guinea, for his encouragement of and confidence in our work. AGIE REEVES, ANDY, CAROLINE GREEN and CLAUDIA KELLER for their kind help with the English and German translations. The work was supported by the Oficina de Cooperación con Guinea Ecuatorial [at present, Instituto de Cooperación para el Desarrollo] of the Spanish Ministerio de Asuntos Exteriores with the cooperation of the Asociación de Amigos de Doñana.

Zusammenfassung

Beitrag zur Kenntnis der Chiropterenfauna der Insel Bioko, Äquatorial-Guinea

Die Fauna der Insel Bioko (ehemals Fernando Poo, Äquatorial-Guinea) ist schon Objekt verschiedener Studien gewesen, aber dennoch nicht vollständig bekannt, besonders was die Chiropterenfauna angeht. Die Fledermausarten *Hipposideros commersoni*, *Glauconycteris beatrix*, *Pipistrellus kuhlii*, *P. tenuipinnis* und *P. cf. capensis* werden zum erstenmal für die Insel erwähnt. Das Vorkommen der Arten *Myonycteris torquata*, *Taphozous mauritanus*, *Nycteris arge*, *Hipposideros cyclops*, *Glauconycteris poensis*, *Mops spurrelli* und *M. thersites*, in früheren Veröffentlichungen als zweifelhaft erwähnt, wird nun auf Bioko bestätigt. Mit diesen Resultaten wird die Liste der Fledermausarten für die Insel Bioko um 25 % erweitert und zählt hiermit 26 Arten.

References

- AELLEN, V. (1952): Contribution á l'étude des chiroptères du Cameroun. Mém. Soc. Neuchât. Sci. Nat. 8, 1–121.
- ANDERSEN, K. (1912a): Catalogue of the Chiroptera in the collection of the British Museum. I. Megachiroptera. London: British Museum (NH).
- (1912b): Brief diagnoses of eight new *Petalia*, with a list of known forms of the genus. Ann. Mag. Nat. Hist. (8) 10, 546–550.
- AZZAROLI PUCGETTI, M. L.; ZAVA, B. (1988): Nouvelles données sur les chiroptères des îles du Cap-Vert. Boll. Mus. reg. Sci. nat. Torino 6, 603–615.
- BASILIO, A. (1962): La vida animal en la Guinea Española. Sec. Ed., Madrid: I.E.A. (C.S.I.C.).
- BERGMANS, W. (1976): A revision of the African genus *Myonycteris* Matschie, 1899 (Mammalia, Megachiroptera). Beaufortia 24, 189–216.
- BOCAGE, J. V. (1889): Chiroptères de l'île St. Thomé. J. Sci. Math. Phys. Nat. 2, 197–199.
- BUTYNSKI, T.; KOSTER, S. (1986): The status and conservation of forest and primates on Bioko Island (Fernando Poo), Equatorial Guinea. WWF Uganda: Impenetrable Forest Conservation Project Report.
- CABRERA, A. (1912): Catálogo de los mamíferos del Museo Nacional de Ciencias Naturales. Trab. Mus. Cienc. Nat., Madrid 11, 1–147.
- CORBET, G. B.; HILL, J. E. (1986): A world list of mammalian species. Sec. Ed., London: Brit. Mus. (Nat. Hist.).
- DOBSON, G. E. (1878): Catalogue of the chiroptera in the collection of the British Museum. London.
- EISENTRAUT, M. (1964): La faune de chiroptères de Fernando-Po. Mammalia 28, 529–552.
- (1973): Die Wirbeltierfauna von Fernando Poo und Westkamerun. Bonner Zool. Monogr. 3, 1–428.
- HAYMAN, R. W.; HILL, J. E. (1971): Order Chiroptera. In: The mammals of Africa. An identification manual. Ed. by J. MEESTER and H. W. SETZER. Washington: Smithsonian Inst. Press. Pp. 1–73.
- HILL, J. E. (1963): A revision of the genus *Hipposideros*. Bull. Br. Mus. Nat. Hist. (Zool.) 11, 1–129.
- (1968): Bats from the Cameroons, with the description of a new species of *Pipistrellus*. Bonn. zool. Beitr. 19, 43–48.
- (1982): Records of bats from Mount Nimba, Liberia. Mammalia 46, 116–120.
- HILL, J. E.; HARRISON, D. L. (1987): The baculum in the Vespertilioninae (Chiroptera: Vespertilionidae) with a systematic review, a synopsis of *Pipistrellus* and *Eptesicus*, and the descriptions of a new genus and subgenus. Bull. Br. Mus. Nat. Hist. (Zool.) 52, 225–305.
- IBÁÑEZ, C.; FERNÁNDEZ, R. (1989): Catálogo de murciélagos de las colecciones del Museo Nacional de Ciencias Naturales. Monografías, Mus. Nac. Cienc. Nat., Madrid 2, 1–54.
- IBÁÑEZ, C.; VALVERDE, J. A. (1985): Taxonomic status of *Eptesicus platyops* (Thomas, 1901) (Chiroptera, Vespertilionidae). Z. Säugetierkunde 50, 241–242.
- JUSTE B., J.; IBÁÑEZ, C. (1993): A new *Tadarida* of the subgenus *Chaerephon* (Chiroptera: Molossidae) from São Tomé Island, Gulf of Guinea (West Africa). J. Mammalogy 74, 901–911.

- KOCK, D. (1969): Über ein weibliches Exemplar der afrikanischen Bulldoggfledermaus, *Xiphonycteris spurrelli*, von Fernando Poo. *Senckerbergiana biol.* **50**, 9–13.
- KOOPMAN, K. F. (1975): Bats of the Sudan. *Bull. Amer. Mus. Nat. Hist.* **154**, 355–443.
- (1993): Order Chiroptera. In: *Mammals species of the world. A taxonomic and geographic reference*. 2nd ed. Ed. by D. E. WILSON and D. M. REEDER. Washington: Smithsonian Institution Press. Pp. 147–241.
- KRUMBIEGEL, I. (1942): Zur Kenntnis der Säugetierfauna von Fernando Poo. *Archiv f. Naturgeschichte* **11**, 305–349.
- ROSEVEAR, D. R. (1965): The bats of West Africa. London: Brit. Mus. (Nat. Hist.).
- THOMAS, O. (1908): New bats and rodents in the British Museum Collection. *Ann. Mag. Nat. Hist.* **2** (8), 370–375.
- THYS VAN DEN ANDENAUERDE, D. F. E. (1967): The freshwater fishes of Fernando Poo. *Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen. Afdeling Natuurkunde* **29** (100), 1–167.
- TRUJILLO, D. (1991): Murciélagos de las Islas Canarias. Madrid: Colección Técnica, ICONA.
- VAN CAKENBERGUE, V.; DE VREE, F. (1985): Systematics of African *Nycteris* (Mammalia: Chiroptera). In: *African Vertebrates*. Ed. by K. SCHUCHMANN. Bonn: Zoolog. Forschungsinst. u. Mus. A. Koenig. Pp. 53–90.
- (1993): Systematics of African *Nycteris* (Mammalia: Chiroptera) part II. The *Nycteris hispidus* group. *Bonn. zool. Beitr.* **44**, 299–332.

Authors' address: Dr. JAVIER JUSTE B. and Dr. CARLOS IBÁÑEZ, Estación Biológica de Doñana, C.S.I.C., Aptdo. 1056, E-41080 Sevilla, Spain